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OCR A Level Computer Science H446 – Paper 1

6

Storage devices

Unit 1
Components of a computer and their uses

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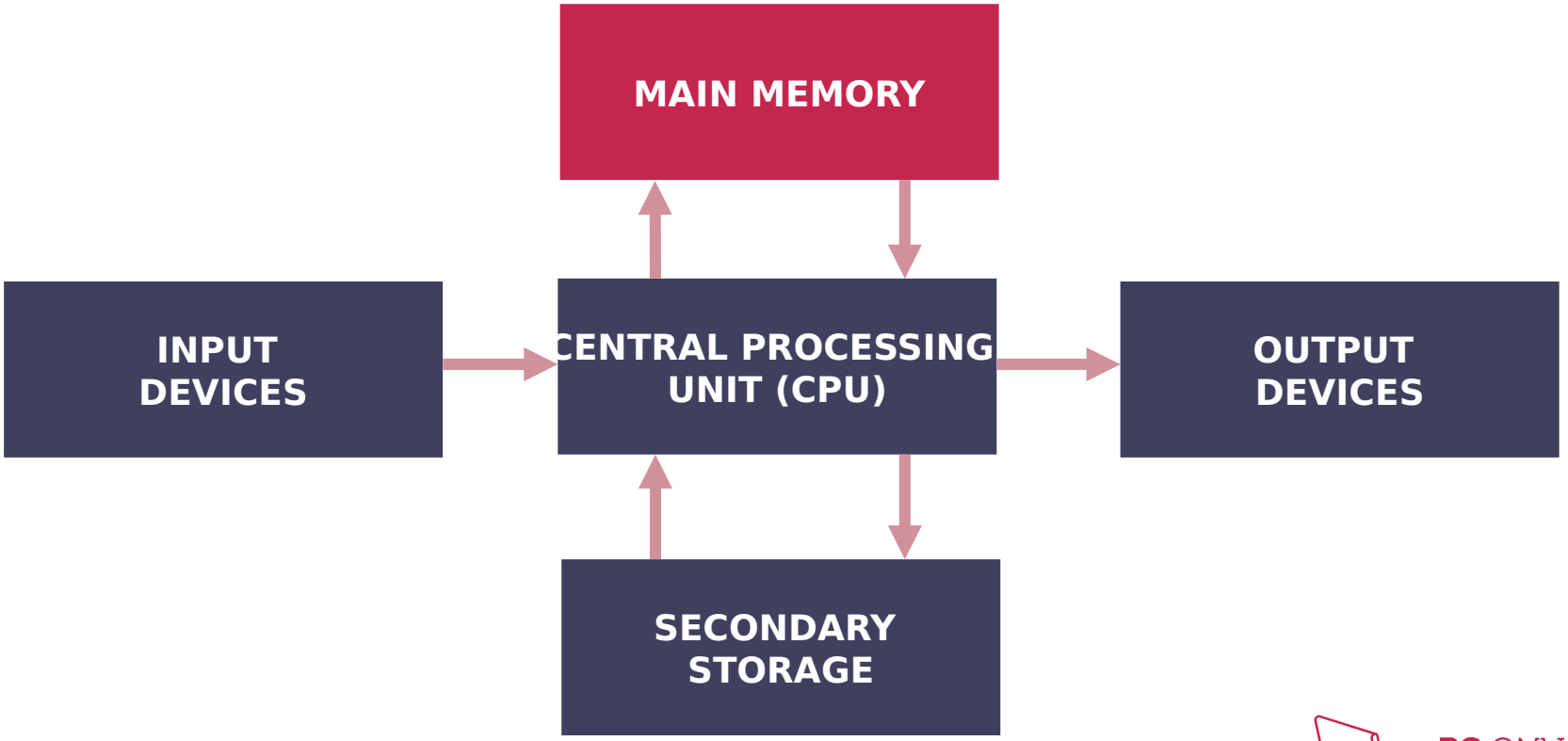
Objectives

- Describe the characteristics and uses of RAM and ROM
- Understand what is meant by virtual storage
- Describe the uses of magnetic, flash and optical storage devices

Primary storage / memory

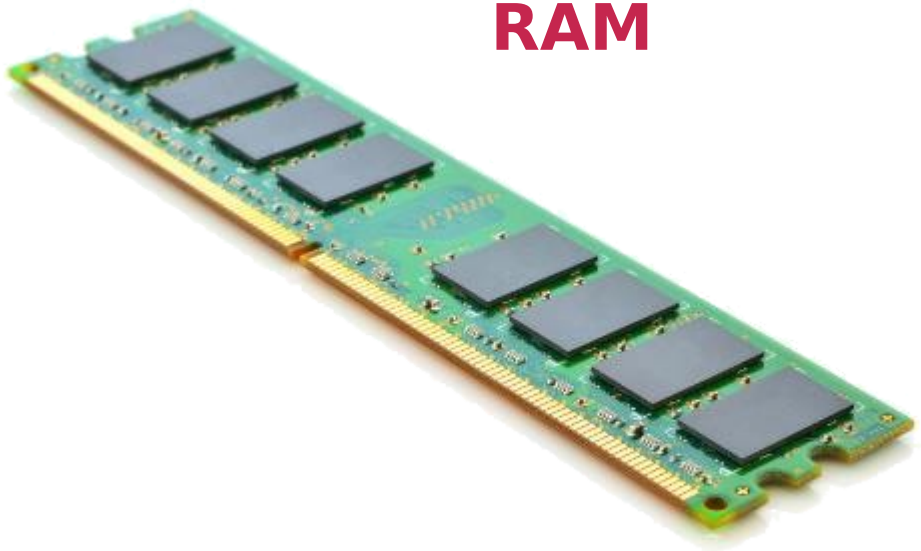
- What do you already know about memory and its role within computer systems?



Types of memory

- There are many types of memory used in computers.
  - The two main types are:

RAM



ROM

RAM & ROM

- **RAM** stands for **R**andom **A**ccess **M**emory
- **ROM** stands for **R**ead **O**nly **M**emory
  - What is the difference?

RAM vs ROM

	RAM	ROM
What does it stand for?		
What is often stored in it?		
What happens to its contents when you turn the power off?		
Can you read and write data to it?		

RAM vs ROM

	RAM	ROM
What does it stand for?	Random Access Memory	Read Only Memory
What is often stored in it?	Operating system Running programs Data currently being used	Computing bootup instructions (Bootstrap)
What happens to its contents when you turn the power off?	They are lost This type of memory is **Volatile**	They are retained This type of memory is **Non-Volatile**
Can you read and write data to it?	Read & Write	Read Only

RAM

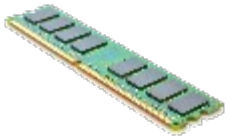
- Can be read from and written to
- Access to RAM is very fast
- At any one time it will normally contain:
    - The operating system (or part currently in use)
    - The software currently in use
    - The data which the software is using

What makes ROM so special?

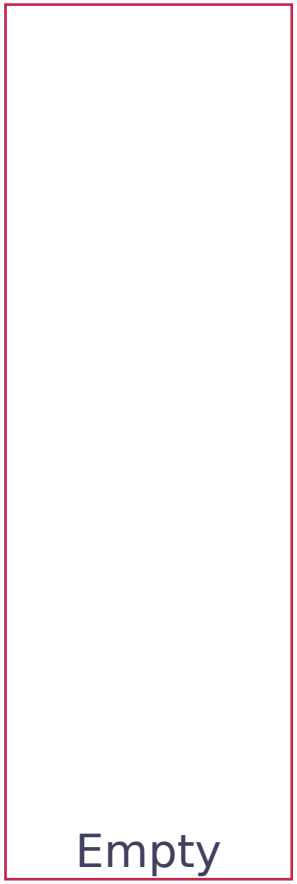
- Some data needs to be permanently held in memory, even when a computer has no power!
  - What instructions do you think a computer must instantly execute when you first switch on a computer?

RAM

- The computer stores running programs and data in RAM when your computer is turned on
- When your computer is off, RAM is empty as it is volatile
  - All your programs and data are safe on your hard disk

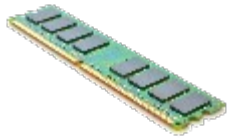


RAM



Operating system

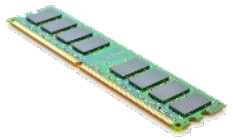
- When you switch on your computer, the startup instructions load the operating system from your hard disk into RAM



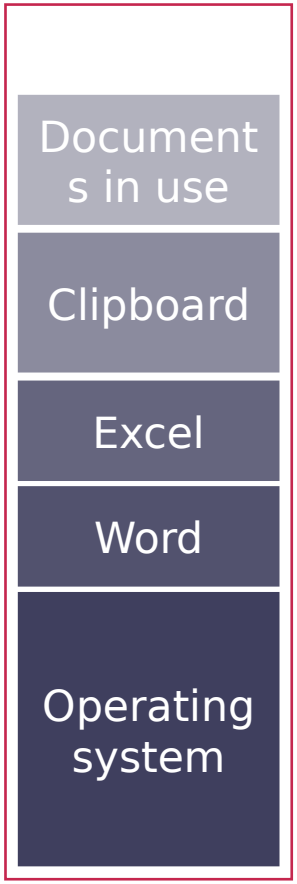
RAM

RAM memory

- When applications or programs are loaded, they are copied into RAM from secondary storage (e.g. hard disk)
  - Documents (data) that are used with those programs are also opened by copying them into RAM as the working memory
- RAM starts to fill up



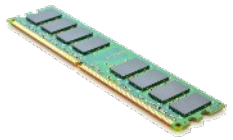
RAM



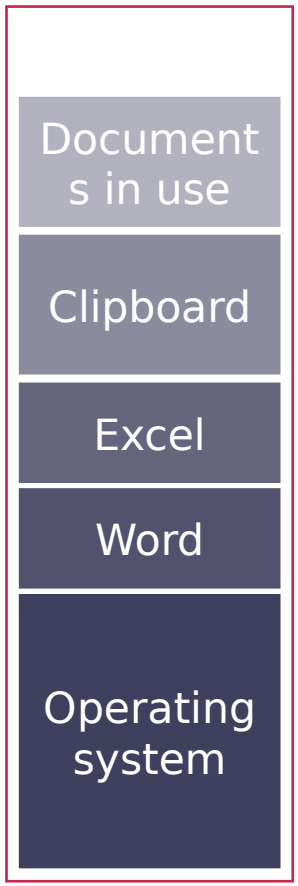
Running out of space

- You now want to open a browser to search the Internet
- The browser software needs more memory than you have free in RAM
  - What do you think happens?

Browser



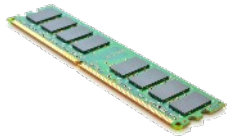
RAM



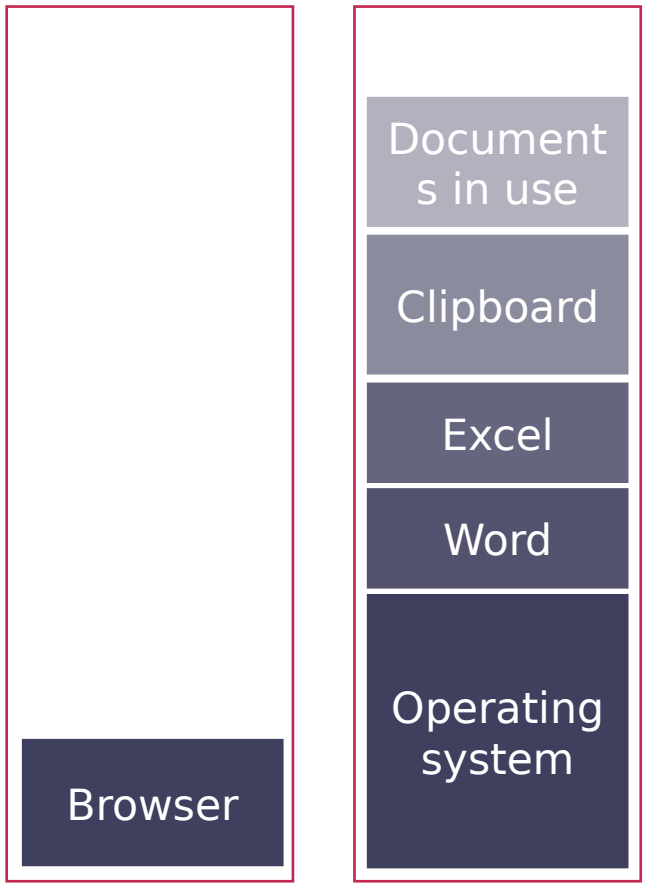
Virtual memory

- Virtual memory is part of the hard drive used as an extension to RAM
  - What are the advantages and disadvantages of using part of the hard disk in this way?

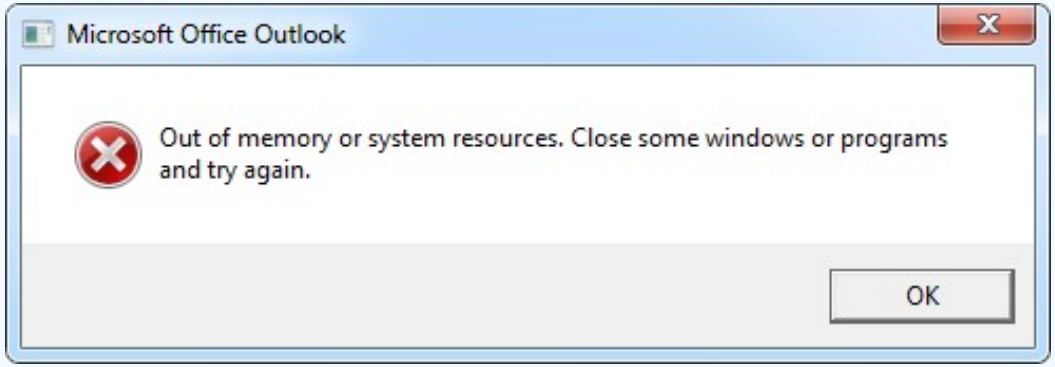
Hard Disk



RAM



What happens when memory space completely fills up?



Primary and secondary storage

- Primary storage is **volatile** and usually refers to RAM
- Secondary storage refers to non-volatile storage
  - Magnetic storage such as the hard disk
  - Optical storage that uses laser light such as CD-ROM
  - Solid state devices using flash memory

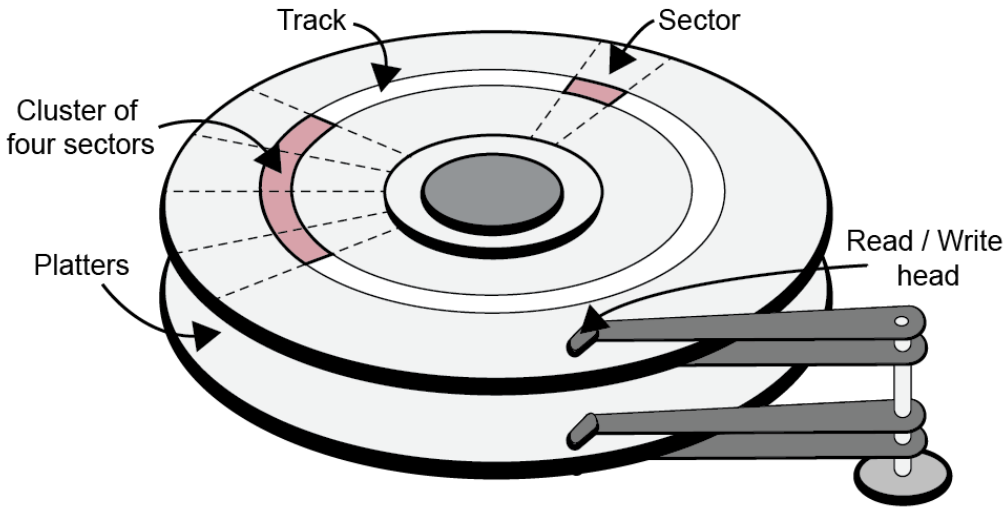
Secondary storage devices

- Different technologies have evolved for saving data
- Each of these have their own advantages and disadvantages in terms of:
  - Durability
  - Read / write speed
  - Capacity
  - Portability and
  - Cost

Inside a hard disk

Tracks, sectors and platters

- Concentric tracks are created on a magnetic disk
- Disk spins at high speed: 3,600 – 7,200rpm
- Spinning platters are each read by drive heads
  - Data i er the head



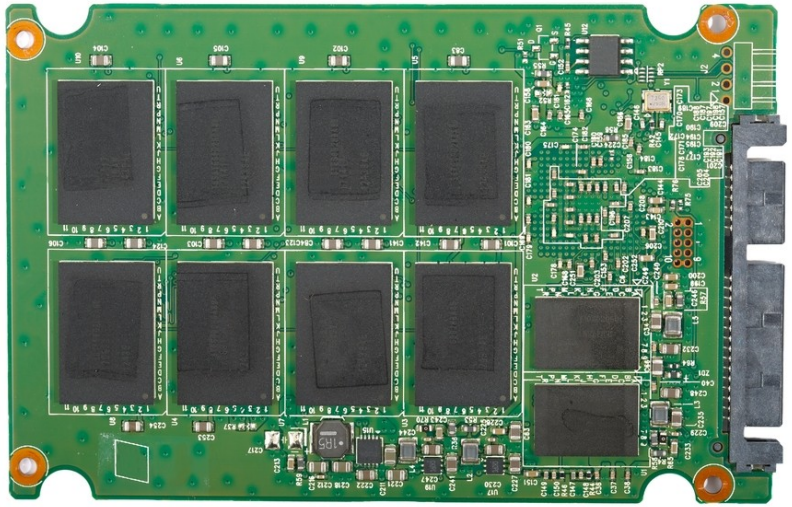
Company server data

- Hard disks have very high capacity
  - Fast read and write speeds
  - Relatively cheap storage per TB

Cloud storage

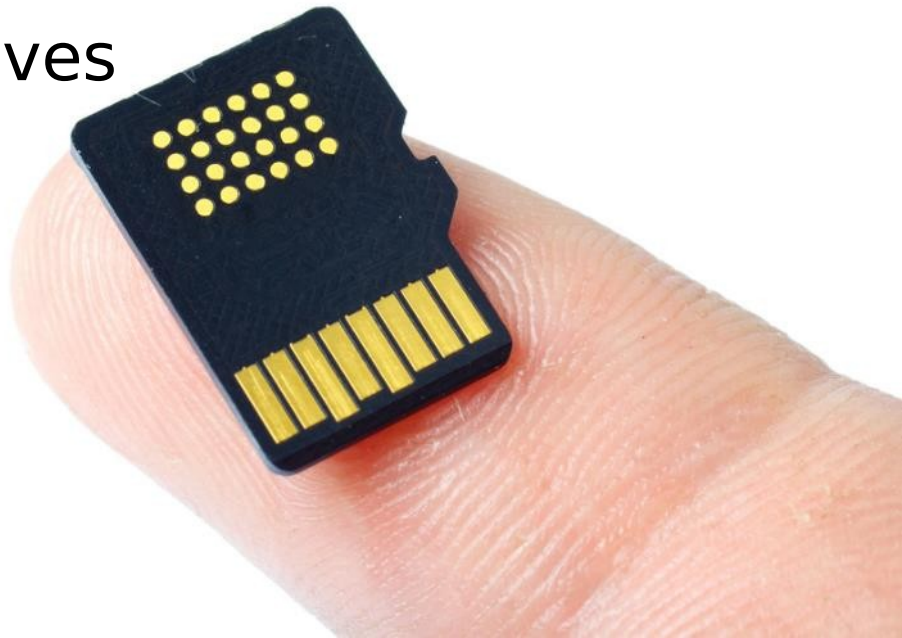
Solid state drives

- Solid state media commonly uses electrically programmable non-volatile flash memory
  - What are the advantages and disadvantages compared with hard disk drives?



Advantages and disadvantages of solid state media

- More durable
  - SSD cards have no moving parts so can survive drops, extreme heat and cold, and extreme pressure
- Typically less capacity than a hard disk
- Faster than hard disk drives
- Consume less power
- More portable
- More expensive than hard disk drives



USB flash drives

- Can store up to 128Gb of data; that’s 2,500 photos
- Prices start at under £5.00
- Can use password protection
- Useful for transferring data between computers

Military data storage systems

- What storage medium is best suited to field combat?
- Why?

Worksheet 6

- Complete **Task 1**

CDs, DVDs and BluRay

- Why are the capacities of these discs different given they are all the same physical size?
  - Different laser wavelengths ‘burn’ smaller pits
  - The spiral track can therefore be more tightly wound, creating a longer track

Optical disk formats

- Optical disks are available as:
  - Read only
  - Recordable and
  - Re-writable formats

Software mailing

- Often best suited to optical disks
- Cheap to manufacture and distribute
- Robust during carriage
- Lightweight

CD formats

- **CD**s come in three different formats:
  - CD-ROM (Read only)
  - CD-R (Recordable)
  - CD-RW (Rewriteable)
- **CD-ROM** is “pressed” at the time of manufacture
- **CD-R** can be written to once
- **CD-RW** can be written, read many times, erased and written again
  - Suggest some uses for each format

Uses for optical disks

- **CD-ROM** is widely used for software distribution
- **CD-R** may be used for copying a game, software, audio or video files or documents. These can then easily be stored offline
- **CD-RW** useful for short- or medium-term backup, or transferring files from one computer to another
- **DVD** and **BluRay** are high-capacity discs which can store feature-length films

Capacity and access speed

- The development of solid state media is moving very quickly and set to replace traditional hard drives in most instances

Media	Capacity	Access speed
Hard disk		
CD-ROM		
DVD		
BluRay Disk		
Solid State Disk		

Capacity and access speed

- The development of solid state media is moving very quickly and set to replace traditional hard drives in most instances

Media	Capacity	Access speed
Hard disk	512 GB – 6 TB	Fast
CD-ROM	700 MB	Medium
DVD	4.7 – 8.5 GB	Medium
BluRay Disk	25 – 50 GB	Medium
Solid State Disk	4 GB – 2 TB	Very fast

Plenary

- Give a typical use for each of RAM and ROM
- Explain what “virtual storage” is. What problems can arise with virtual storage?
- List advantages and disadvantages of HDD vs SSD
- Describe uses for CD-ROM, CD-RW, DVD, BluRay

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